

Visualization of Effective Tax Rates for Tax Gap Estimation and Compliance Risk Assessment

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In common with other fiscal authorities, Her Majesty's Revenue and Customs (HMRC) in the United Kingdom has been seeking to improve its understanding of the nature of the tax gap and develop additional responses to tackle it. One way of analyzing the amount of tax paid by taxpayers is to calculate the total tax they pay as a proportion of their total incomes. This ratio is sometimes known as the taxpayers' Effective Tax Rate (ETR).

HMRC has developed an innovative visual tool that plots Effective Tax Rates for high-income individuals paying Self Assessment Income Tax. The tool produces interactive graphs that can be changed in real time to display only taxpayers with a chosen set of characteristics. The characteristics on which taxpayers can be selected include any combination of one or more of the following: income source (employment, partnership, sole trade), level of total income, the amount of a range of different tax reliefs claimed, amount of any losses affecting tax liability, and whether the taxpayer's affairs have been or are currently subject to enquiry (audit).

The tool provides a quick visual description of taxpayers that offers compliance managers an insight into the group held in the model. It can also provide staff selecting cases for investigation with an additional method to review cases that instantly shows those taxpayers paying the least tax relative to their incomes. In addition to the tool, the project has also produced analysis of the relative effect on individual tax liabilities of various deductions and reliefs.

The tool has been enthusiastically received by compliance staff in HMRC with responsibilities in both strategic and operational spheres for the quick accessible insight it gives. A pilot study of the tool as an aid to risk assessment has produced encouraging though small-scale results.

The project was developed by analysts exploiting the software rather than in response to a specific requirement. Once developed and demonstrated, the interest of compliance staff in the tool and running pilots was clear. In part, the project builds on earlier work analyzing the caseload of HMRC's Complex Personal Tax Teams. (These are specialist teams that deal with taxpayers having the most complex affairs.)

The remainder of this paper is structured as follows. The next section gives some background information on UK Income Tax and the Income Tax Self Assessment system. A description of the methodology used in the project and the results obtained follow before outlining plans for developing the work further.

United Kingdom Income Tax

Around 30 million people are subject to United Kingdom Income Tax. It applies to many but not all sources of individual income. The amount of income that is taxable is calculated by adding together all income from taxable sources and then subtracting any allowances and reliefs that apply.

All individuals are entitled to a personal allowance, and, in Tax Year 2002-2003—the year to which most of the results in this paper apply—the rate applicable to most individuals was £4,615. (Effectively, the result of the personal allowance means that, for individuals with straightforward affairs, the first £4,615 of their incomes is not taxed.) After reliefs and allowances have been subtracted from an individual's income, the remaining income is taxable. The first £1,920 (in 2002/03) of this is taxed at the starting rate—normally 10 percent—while the next £27,980 (2002/03) are taxed at the basic rate—22 percent for employment and self-employment income and 20 percent for savings income. Taxable income greater than £29,900 for 2002-2003 is taxed at the higher rate of 40 percent (32.5 percent for dividends).

The UK Income Tax Self Assessment System

Income Tax Self Assessment (SA) was introduced in 1996 and applies to around a third of the 30 million individual income tax taxpayers in the UK. For other income taxpayers, the tax due is withheld at the income source—for example, by an employer—and remitted directly to HMRC.

For Tax Year 2002-2003 (April 6, 2002–April 5, 2003), just under 9.5 million Self Assessment tax returns were issued. Individuals required to complete a tax return include the self-employed, company directors, higher-rate taxpayers, and other taxpayers with complex affairs. However from Tax Year 2004-2005 onwards, some taxpayers with more straightforward tax affairs that were formerly included within the SA system are no longer required to file a return. Information on the SA system, including details of the criteria for inclusion of individuals within the SA system, is available on the HMRC Internet site (<http://www.hmrc.gov.uk/sa/>, and Appendix 1 contains additional links). Besides individuals, the SA system also covers returns from partnerships, trusts, and the estates of deceased persons.

Most individual SA taxpayers are required to complete a core return covering such topics as savings, dividends, pensions, and charitable gifts. In

addition, individuals covered by the SA system are required to complete additional schedules for other income sources, including employment, self-employment, partnership, trust and foreign income, and capital gains. Figure 1 shows an example page from the schedule for employment income. Each question on the tax return has a numbered answer box; the number indicates which schedule the question appears on and the number of the question itself. In addition to the removal from SA of certain taxpayers mentioned above, for Tax Year 2004-2005, over 1 million further taxpayers with simpler affairs have been asked to complete a shorter form known as the Short Tax Return.

Figure 1.--Example Page from Employment Schedule of UK Income Tax Self Assessment return

HM Revenue Income for the year ended 5 April 2003

EMPLOYMENT

Name Tax reference

Fill in most boxes first

If you want help, look up the box numbers in the Notes.

Details of employer

Employer's PAYE reference – may be shown under 'Inland Revenue office number and reference' on your P45 or 'PAYE reference' on your P45 **1.1**

Employer's name **1.2**

Date employment started (only if between 6 April 2002 and 5 April 2003) **1.3**

Date employment finished (only if between 6 April 2002 and 5 April 2003) **1.4**

Employer's address **1.5**

Postcode

Tick box 1.6 if you were a director of the company ☐ **1.6** and, if so, tick box 1.7 if it was a close company ☐ **1.7**

Income from employment

Money – see Notes, page EN3

• Payments from P45 (or P45) **1.8** £

• Payments not on P45, etc. – tips **1.9** £

– other payments (excluding expenses entered below and lump sums and compensation payments or benefits entered overhead) **1.10** £

• Tax deducted in the UK from payments in boxes 1.8 to 1.10 **1.11** £

Benefits and expenses – see Notes, pages EN3 to EN6. If any benefits connected with termination of employment were received, or enjoyed, after that termination and were from a former employer you need to complete Help Sheet HS204, available from the Office. Do not enter such benefits here.

• Assets transferred/ payments made for you **1.12** £

• Vans **1.13** £

• Vouchers, credit cards and tokens **1.14** £

• Interest-free and low-interest loans (see Note for box 1.18, page EN5) **1.15** £

• Living accommodation **1.16** £

Box 1.19 is not used

• Excess mileage allowances and passenger payments **1.17** £

• Private medical or dental insurance **1.20** £

• Company cars **1.21** £

• Other benefits **1.22** £

• Fuel for company cars **1.23** £

• Expenses payments received and balancing charges **1.24** £

SA101 85 12/2002/whl Tax Return (UK) Employment (main E1) Please turn over

From the answers the taxpayer gives on his or her return, it is possible to calculate the taxpayer's Income Tax liability. A tax calculation guide enables taxpayers (except a very small number with very rare circumstances) to calculate their tax liabilities for the year and payments due. The returns, supplementary schedules, tax calculation guide, and other guidance can be viewed on the HMRC Web site (see Appendix 1 for links).

Methodology

The effective tax rates used in the project are calculated by dividing an individual's total income tax liability by the total net income declared on his or her tax return.

While this provides a useful measure of a taxpayer's liability relative to income, it is important to note that it has some limitations. The main limitations are that it does not reflect income that is not declared on the tax return or that arises from capital gains, and that it does not take into account personal and business expenses netted off income.

For the element of the project seeking to understand aspects of the tax gap in more detail, the algorithm used to calculate liabilities was reproduced in the Department's statistical software. Then by recalculating an individual's liability while successively setting deductions to nil, the effect of the deductions on the overall tax liability for the individuals covered was established.

A second part of the project involved building a spreadsheet model. The model has three purposes. It produces a histogram showing the distribution of effective tax rates and also provides a plot of individual ETR's against income. The taxpayers included in these graphs can be interactively filtered in real time according to a range of criteria to improve understanding of the taxpayers and their characteristics. This functionality leads to the final purpose which is to provide an aid to compliance risk assessment.

The model takes data on a range of entries and derived quantities from the returns of individual SA taxpayers, including the following:

- Total income from taxable sources
- Income tax liability after allowances and reliefs
- Self-employment losses
- Partnership losses
- Land and Property rental losses
- Capital gain losses
- Charitable gifts qualifying for tax relief

- Venture Capital and Enterprise Investment Scheme reliefs
- Relief on qualifying loan interest payments

Practically, the model is built as a Microsoft Excel spreadsheet and handles information on up to 65,500 taxpayers at a time. (This limit stems from the maximum number of rows in an Excel worksheet.)

The Excel model consists of 4 main worksheets and a number of Visual Basic macros. The main data for the model are held in the first worksheet in the form of a list of cases. The list includes the attributes described above for each case. A second worksheet is used as the basis of the output graphs and contains a copy of the whole list or a filtered subset of it. The contents of the second sheet can be filtered according to a range of attributes of the cases, including total income, ETR, and the quantities listed above. For example, the list in the second worksheet could be filtered to contain only individuals who had an income of under £500,000, an effective tax rate of less than 20 percent, and income (and/or losses) from a partnership. Visual Basic drives the real-time filtering of the list. In order to show cases satisfying particular conditions, the desired criteria are entered in text boxes or via drop-down lists of categories of taxpayers. For example, to select cases with income under £500,000, the text <500000 would be entered in the box relating to income. When the chosen criteria have been entered, a macro copies all the cases matching the criteria entered from the first worksheet to the second one. The macro is activated by the use of a drop-down list or by entering a single quote into one of the text boxes. (The use of a single quote to activate the filtering is an arbitrary choice.) If no criteria are entered, the macro copies the whole list.

The criteria are entered on a third worksheet which also displays the graph of the ETR against income for the selected cases. The graph uses a log scale for the income axis and a different color and point shape to distinguish taxpayers who are dealt with by the specialist Complex Personal tax teams. Finally, a histogram of effective tax rates for the selected cases is on a fourth sheet.

For use as a risk assessment aid, the spreadsheet also includes data on enquiries (audits) from the Department's enquiry case management system (Compliance Workbench or CQI) and details of the office responsible for dealing with each taxpayer. As well as the criteria mentioned above, the plots can be also filtered to show which cases are being or have been audited.

Once the data have been filtered to the satisfaction of the user, the details of the selected cases can be obtained from the second worksheet, further investigation, and—if appropriate—audit. Also, if the filtering of the spreadsheet reveals any cases of particular interest, highlighting a point in the chart and clicking a button displays the individual's tax reference.

The model has been piloted in two area offices as a supplementary risk assessment aid. Separate lists of high-income cases were built for each of the pilot offices. The offices had differing caseloads (one tending to specialize in employees of financial institutions and the other having a more general caseload). The process used in the pilots was to employ the model to shortlist cases for a detailed risk assessment and consideration for audit. Once the detailed assessment was complete, cases showing a high level of risk would be selected for audit. When the enquiries were completed, the outcomes were recorded.

Results

The first output of the project model is analysis of the relative impacts of various deductions from taxable income (such as losses). The model produces histograms of Effective Tax Rates for all cases in the model or those selected according to criteria of interest, and plots of individual ETR's against Income from taxable sources.

Analysis of deductions

Table 1 shows a breakdown of aggregate total deductions from income across a sample of taxpayers. The deductions shown cover a range of reasons, such as partnership losses, postcessation business expenses/ losses on relevant discounted securities, etc. Some of the types of losses shown in the table are influenced by the use of tax avoidance schemes. The table is useful in considering and assessing the relative magnitude of different deductions from taxable income, and the possible impact of avoidance schemes on tax revenues.

Distributions of effective tax rates

The previous section described how the Excel model can produce histograms of the distribution. Figure 2 shows a histogram for a random sample of

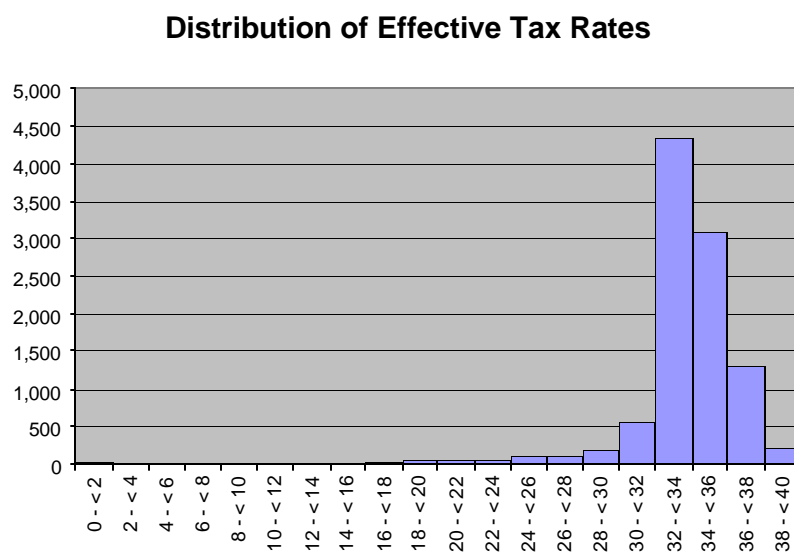
Table 1: Analysis of deductions from total income for taxpayers with income of between £100,000 and £1,000,000. Percentages of the total value of deductions, 2001/02 tax year.

Self Employment losses	13%
Partnership losses	40%
Land and Property losses	19%
Capital losses	6%
Post Cessation expenses and losses on relevant discounted securities etc.	16%
Gifts of Investments	7%
Total of these deductions	100%

30,000 taxpayers dealt with in HMRC's network compliance offices. The individuals shown are employees who had total income in Tax Year 2002-2003 of between £100,000 and £1,000,000. Company directors are not included.

When viewing this chart, it is important to remember that the maximum ETR for these individuals, assuming they had no deductions for reliefs, etc., would be somewhat less than 40 percent. This is because a part of taxpayers' incomes (covered by their personal allowances) is exempt from tax, and other elements of their incomes will be taxed at rates lower than 40 percent. Additionally, a low ETR is not necessarily a sign of a compliance risk, since taxpayers may have low effective tax rates for fully legitimate reasons. Dividend income is, for example, taxed at a lower rate than employment income, and trading losses may be set against tax. However, for some taxpayers in certain circumstances, a low ETR can be an indicator of the use of a tax avoidance scheme.

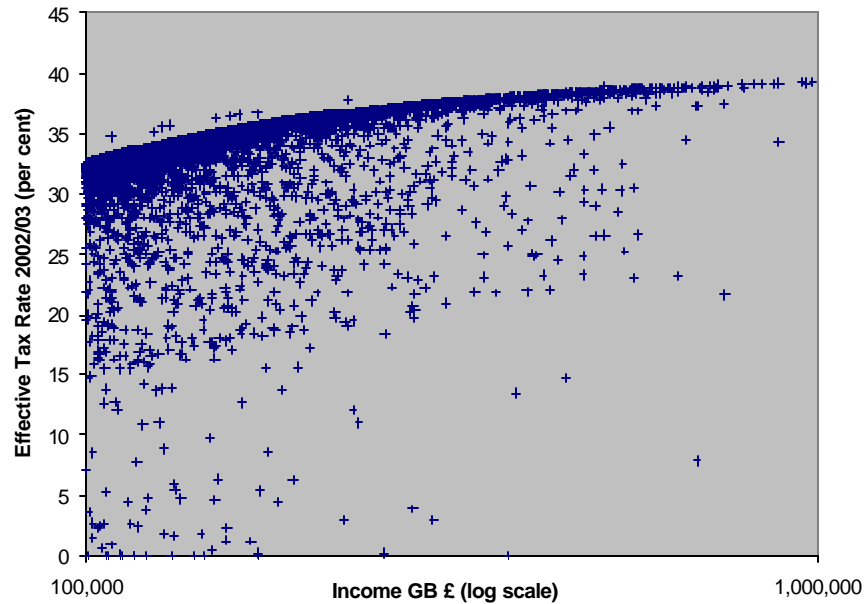
Figure 2.--Histogram of effective tax rates for a sample of individuals with income between £100,000 and £1,000,000 (employees excluding company directors)



Analysis of effective tax against income

Figure 3 plots the ETR's for individuals included in the histogram above against their incomes. Again, for the reasons mentioned above, taxpayers may have low effective tax rates for fully valid reasons.

Figure 3.--Effective tax rates against income for a sample of individuals with income between £100,000 and £1,000,000 (employees excluding company directors)



Results of pilot

The model was piloted by compliance teams in two area offices. The pilots had two aims: to test the model as a tool to help operational compliance staff understand the characteristics of the caseload, and to test the usefulness of the model as an aid to risk assessment for audit.

Against the first aim, the model was enthusiastically received in both pilot areas. Both requested updates of the model for use with the following year's caseload. As a risk assessment tool, the more specialist area made limited use of the model due to other resource intensive projects taking priority; however, they did open one audit as a result of using the model. The outcome of that audit is not yet known. The second area used the model to produce a shortlist of ten cases for detailed risk assessment. From these, they opened four enquiries. Three of these have been completed. At the time of writing, one produced no additional tax yield, while two resulted in a yield of

between £1,000 and £10,000 pounds each. The final case with a large potential tax yield had been referred to a specialist team for investigation.

Future Plans

Plans for the development of the model cover include updating it to the most recent year's data and tackling some of its current limitations, such as the restriction on the maximum number of cases, and incorporating information on Capital Gains. The development will also aim to make improvements based on experience from the pilots.

It is also hoped to improve the plotting of the ETR graph so that the markers are clearer when there are small numbers of points shown, and so that the category distinguished by different colors in the plot (currently, the type of tax office responsible for the case) could be changed using a drop-down menu or buttons.

Finally, the use of the model as a risk assessment aid is to be continued in the pilot offices and extended to a larger number of offices for returns currently under review. It is also intended to explore the possibility of a more formal evaluation of the benefits of the model, but this will depend on the wider objectives of the Department's business.

Acknowledgements

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Appendix 1

Further information is available as follows. The main HMRC Internet site for Income Tax Self Assessment (ITSA) is <http://www.hmrc.gov.uk/sa/>, while a leaflet giving an overview of ITSA is at <http://www.hmrc.gov.uk/leaflets/sa.htm> (see leaflet ref SA/BK8, titled "Self Assessment. Your guide"). Details of the criteria for inclusion of cases within ITSA can be found at: <http://www.hmrc.gov.uk/sa/guidelines.htm>, and copies of the form and tax calculation guide for Tax Year 2002-2003 are located at http://www.hmrc.gov.uk/sa/forms/net_02-03.htm. Finally, statistics on Income Tax can found at http://www.hmrc.gov.uk/stats/income_tax/index.htm.